IN THE CLAIMS:

1.-18. (Cancel)

19. (Previously Presented) A magnetic recording sensor having a structure comprising a plurality of cells in parallel including a magnetoresistive sensor for recording information, a bit line connected to the magnetoresistive sensor for flowing an electric current to the sensor, a word line in the position opposite the bit line by interposing therebetween the magnetoresistive sensor layer and in the position away from the magnetoresistive sensor layer for performing recording operation onto the magnetoresistive sensor layer orthogonally to the bit line, an amplifying system for amplifying a read signal, and a read word line for switching between read and write, wherein the magnetoresistive sensor comprises the magnetoresistive sensor layer, and a layer for magnetic domain-controlling the magnetoresistive sensor layer is provided with the magnetic domain control layer having high electric resistivity according to any one of the magnetoresistive sensor including a substrate, a pair of magnetic shield layers consisting of a lower magnetic shield layer and an upper magnetic shield layer, a magnetoresistive sensor layer disposed between the pair of magnetic shields, an electrode terminal for flowing a signal current perpendicular to the plane of the magnetoresistive sensor layer, and magnetic domain control layers for controlling Barkhausen noise of said magnetoresistive sensor layer, wherein said magnetic domain control layers disposed on opposite ends of the magnetoresistive sensor layer in a region from an end surface of a media-opposed surface side of the magnetoresistive sensor layer to a depth position are made of a material having a

specific resistance not less than 10 mΩcm, and are in contact with at least opposite end surfaces of said magnetoresistive sensor layer in said region.

20. (Previously Presented) A magnetic recording sensor comprising:

a plurality of cells in parallel including a magnetoresistive sensor for recording information;

a bit line connected to the magnetoresistive sensor for flowing an electric current to the sensor;

a word line in the position opposite the bit line by interposing therebetween the magnetoresistive sensor layer and in the position away from the magnetoresistive sensor layer for performing a recording operation onto the magnetoresistive sensor layer orthogonally to the bit line;

an amplifying system for amplifying a read signal; and

a read word line for switching between read and write,

wherein the magnetoresistive sensor comprises the magnetoresistive sensor layer, and magnetic domain control layers disposed on opposite ends of the magnetoresistive sensor layer, and

said magnetic domain control layers have a compound having a composition of R_2O_3 containing at least R (R= Fe, Co, Mn, and Ni) and oxygen (O) and has a spinel lattice and a (400) orientation plane.

21. (Previously Presented) A magnetic recording sensor according to clam 20, wherein

a material consisting of a oxide underlayer of said magnetic domain control layer is a compound of RO consisting of at least R(R=Co, Mg, Ni, Eu, Fe, and Zn) and oxygen (O) and has a NaCl structure and a (200) orientation plane, and

a material consisting of said magnetic domain control layer on the oxide underlayer is a compound having a composition of R_2O_3 containing at least R (R= Fe, Co, Mn, and Ni) and oxygen (O) and has a spinel lattice and a (400) orientation plane.

22. (Currently Amended) A magnetic recording sensor according to claim 20, wherein

magnetic domain control layer comprises the compound layer disposed in contact with opposite ends of said magnetoresistive sensor layer, and a hard magnetic layer disposed outside the same, and

said hard magnetic layer is made of a metal magnetic material having as the composition elements Co (cobalt), Cr (chromium), Pt (platinum), Ta (tantalum), and Ni ~~(niobate)~~ (niobium).

23. (Currently Amended) A magnetic recording sensor comprising:

a plurality of cells in parallel including a magnetoresistive sensor for recording information;

a bit line connected to the magnetoresistive sensor for flowing an electric current to the sensor;

a word line in the position opposite the bit line by interposing therebetween the magnetoresistive sensor layer and in the position away from the

magnetoresistive sensor layer for performing recording operation onto the magnetoresistive sensor layer orthogonally to the bit line;

an amplifying system for amplifying a read signal; and

a read word line for switching between read and write,

wherein the magnetoresistive sensor comprises the magnetoresistive sensor layer, and magnetic domain control layers disposed on opposite ends of the magnetoresistive sensor layer,

said magnetic domain control layers have a material that is granular layer made by mixing a hard magnetic material having high coercivity made of a metal magnetic material having as the composition elements Co (cobalt), Cr (chromium), Pt (platinum), Ta (tantalum), and Nb ~~(niobate)~~(niobium) with an insulating material made of Al_2O_3, SiO_2, HfO_2, TaO_2, TiO_2, Ta_2O_5, AlN, AlSiN, or ZrO_2.

24. (Currently Amended) A magnetic recording sensor according to claim 23, wherein

magnetic domain control layer comprises the granular layer disposed in contact with opposite ends of said magnetoresistive sensor layer, and a hard magnetic layer disposed outside the same, and

said hard magnetic layer is made of a metal magnetic material having as the composition elements Co (cobalt), Cr (chromium), Pt (platinum), Ta (tantalum), and Ni ~~(niobate)~~ (niobium).

25. (Previously Presented) A magnetoresistive sensor including a substrate, a pair of magnetic shield layers consisting of a lower magnetic shield layer and an

upper magnetic shield layer, a magnetoresistive sensor layer disposed between the pair of magnetic shields, an electrode terminal for flowing a signal current perpendicular to the plane of the magnetoresistive sensor layer, and magnetic domain control layers for controlling Barkhausen noise of said magnetoresistive sensor layer, wherein said magnetic domain control layers disposed on opposite ends of the magnetoresistive sensor layer in a region from the end surface of a media-opposed surface side of the magnetoresistive sensor layer to the depth position are made of a material having a specific resistance not less than 10 mΩcm, and are in contact with at least opposite end surfaces of said magnetoresistive sensor layer in said region; wherein

each magnetic domain control layer of said magnetic domain control layers includes regions of hard magnetic material having high coercivity made of a metal magnetic material having a composition including at least one of the elements of Co (cobalt), Cr (chromium), Pt (platinum), Ta (tantalum), and Nb (niobium), and regions of insulating material made of at least one of Al2O3, SiO2, HfO2, TaO2, TiO2, Ta2O5, AlN, AlSiN, or ZrO2, said each magnetic domain control layer including at least two of the regions of hard magnetic material which are separated from one another;

said magnetoresistive sensor comprises magnetic yoke layers disposed between the pair of magnetic shields, having a shape extended from the position exposed from the media-opposed surface in the depth direction, and guiding the magnetic field of the recording media to its interior; and

said magnetoresistive sensor layer is disposed between the magnetic yoke layers in the position recessed from the media-opposed surface, said magnetic

domain control layers are provided on opposite ends of the magnetoresistive sensor layer in a region from the end surface of the media-opposed surface side of the magnetoresistive sensor layer and the magnetic yoke layer to the depth position and are in contact with at least opposite end surfaces of said magnetoresistive sensor layer in said region, and the magnetic domain control layers are in contact with opposite end surfaces of said magnetic yoke layer in at least one portion of the region from the end surface of the media-opposed surface side of said magnetic yoke layer to the depth position.

26. (Previously Presented) A magnetoresistive sensor including a substrate, a pair of magnetic shield layers consisting of a lower magnetic shield layer and an upper magnetic shield layer, a magnetoresistive sensor layer disposed between the pair of magnetic shields, an electrode terminal for flowing a signal current perpendicular to the plane of the magnetoresistive sensor layer, and magnetic domain control layers for controlling Barkhausen noise of said magnetoresistive sensor layer, wherein said magnetic domain control layers disposed on opposite ends of the magnetoresistive sensor layer in a region from the end surface of a media-opposed surface side of the magnetoresistive sensor layer to the depth position are made of a material having a specific resistance not less than 10 mΩcm, and are in contact with at least opposite end surfaces of said magnetoresistive sensor layer in said region; wherein

each magnetic domain control layer of said magnetic domain control layers includes regions of hard magnetic material having high coercivity made of a metal magnetic material having a composition including at least one of the elements of Co

(cobalt), Cr (chromium), Pt (platinum), Ta (tantalum), and Nb (niobium), and regions of insulating material made of at least one of Al2O3, SiO2, HfO2, TaO2, TiO2, Ta2O5, AlN, AlSiN, or ZrO2, said each magnetic domain control layer including at least two of the regions of hard magnetic material which are separated from one another; and

said magnetoresistive sensor comprises a flux guide type magnetic yoke layer disposed between the pair of magnetic shields, having a shape extended from the position exposed from the media-opposed surface in the depth position, and being in contact with any one of the magnetic shield layers to guide the magnetic flux of the media, and said magnetic domain control layers for controlling Barkhausen noise of the magnetoresistive sensor layer and the flux guide type magnetic yoke layer, wherein said magnetoresistive sensor layer is disposed at the upper or lower side of said flux guide type yoke layer in the position recessed from the media-opposed surface, the flux guide type yoke layer has an discontinuous portion in a region in contact with said magnetoresistive sensor layer, said magnetic domain control layers disposed on opposite ends of the magnetoresistive sensor layer in the region from the end surface of the media-opposed surface side of said magnetoresistive sensor layer and said flux guide type magnetic yoke layer to the depth position are in contact with at least opposite end surfaces of said magnetoresistive sensor layer in the region from the end surface of the media-opposed surface side of said magnetoresistive sensor layer to the depth position, and the magnetic domain control layers are in contact with opposite end surfaces of said magnetic yoke layer in at least one portion of the region from the end surface of media-opposed surface side of said magnetic yoke layer to the depth position.

27. (Previously Presented) A magnetoresistive sensor including a substrate, a pair of magnetic shield layers consisting of a lower magnetic shield layer and an upper magnetic shield layer, a magnetoresistive sensor layer disposed between the pair of magnetic shields, an electrode terminal for flowing a signal current perpendicular to the plane of the magnetoresistive sensor layer, and magnetic domain control layers for controlling Barkhausen noise of said magnetoresistive sensor layer, wherein said magnetic domain control layers disposed on opposite ends of the magnetoresistive sensor layer in a region from the end surface of a media-opposed surface side of the magnetoresistive sensor layer to the depth position are made of a material having a specific resistance not less than 10 mΩcm, and are in contact with at least opposite end surfaces of said magnetoresistive sensor layer in said region; wherein

each magnetic domain control layer of said magnetic domain control layers includes regions of hard magnetic material having high coercivity made of a metal magnetic material having a composition including at least one of the elements of Co (cobalt), Cr (chromium), Pt (platinum), Ta (tantalum), and Nb (niobium), and regions of insulating material made of at least one of Al2O3, SiO2, HfO2, TaO2, TiO2, Ta2O5, AlN, AlSiN, or ZrO2, said each magnetic domain control layer including at least two of the regions of hard magnetic material which are separated from one another; and

said magnetic domain control layer includes an underlayer made of an oxide having a thickness not more than 5 nm, and an oxide material having high electric resistivity not less than 10 mΩcm formed on the oxide underlayer.

28. (Previously Presented) The magnetoresistive sensor according to claim 25, wherein said magnetic domain control layer includes an underlayer made of an oxide having a thickness not more than 5 nm, and an oxide material having high electric resistivity not less than 10 mΩcm formed on the oxide underlayer.

29. (Previously Presented) The magnetoresistive sensor according to claim 26, wherein said magnetic domain control layer includes an underlayer made of an oxide having a thickness not more than 5 nm, and an oxide material having high electric resistivity not less than 10 mΩcm formed on the oxide underlayer.

30. (Previously Presented) A magnetoresistive sensor including a substrate, a pair of magnetic shield layers consisting of a lower magnetic shield layer and an upper magnetic shield layer, a magnetoresistive sensor layer disposed between the pair of magnetic shields, an electrode terminal for flowing a signal current perpendicular to the plane of the magnetoresistive sensor layer, and magnetic domain control layers for controlling Barkhausen noise of said magnetoresistive sensor layer, wherein said magnetic domain control layers disposed on opposite ends of the magnetoresistive sensor layer in a region from the end surface of a media-opposed surface side of the magnetoresistive sensor layer to the depth position are made of a material having a specific resistance not less than 10 mΩcm, and are in contact with at least opposite end surfaces of said magnetoresistive sensor layer in said region; wherein

each magnetic domain control layer of said magnetic domain control layers includes regions of hard magnetic material having high coercivity made of a metal

magnetic material having a composition including at least one of the elements of Co (cobalt), Cr (chromium), Pt (platinum), Ta (tantalum), and Nb (niobium), and regions of insulating material made of at least one of Al2O3, SiO2, HfO2, TaO2, TiO2, Ta2O5, AlN, AlSiN, or ZrO2, said each magnetic domain control layer including at least two of the regions of hard magnetic material which are separated from one another; and

said magnetic domain control layer is at least partially superimposed on the plane of said magnetoresistive sensor layer.

31. (Previously Presented) A magnetoresistive sensor including a substrate, a pair of magnetic shield layers consisting of a lower magnetic shield layer and an upper magnetic shield layer, a magnetoresistive sensor layer disposed between the pair of magnetic shields, an electrode terminal for flowing a signal current perpendicular to the plane of the magnetoresistive sensor layer, and magnetic domain control layers for controlling Barkhausen noise of said magnetoresistive sensor layer, wherein said magnetic domain control layers disposed on opposite ends of the magnetoresistive sensor layer in a region from the end surface of a media-opposed surface side of the magnetoresistive sensor layer to the depth position are made of a material having a specific resistance not less than 10 mΩcm, and are in contact with at least opposite end surfaces of said magnetoresistive sensor layer in said region; wherein

each magnetic domain control layer of said magnetic domain control layers includes regions of hard magnetic material having high coercivity made of a metal magnetic material having a composition including at least one of the elements of Co

(cobalt), Cr (chromium), Pt (platinum), Ta (tantalum), and Nb (niobium), and regions of insulating material made of at least one of Al2O3, SiO2, HfO2, TaO2, TiO2, Ta2O5, AlN, AlSiN, or ZrO2, said each magnetic domain control layer including at least two of the regions of hard magnetic material which are separated from one another; and

said magnetoresistive sensor layer is a tunnel magnetoresistive sensor layer.

32. (Previously Presented) A combined magnetic head mounting a write element and a read element, wherein the read element comprises a magnetoresistive sensor including a substrate, a pair of magnetic shield layers consisting of a lower magnetic shield layer and an upper magnetic shield layer, a magnetoresistive sensor layer disposed between the pair of magnetic shields, an electrode terminal for flowing a signal current perpendicular to the plane of the magnetoresistive sensor layer, and magnetic domain control layers for controlling Barkhausen noise of said magnetoresistive sensor layer, wherein said magnetic domain control layers disposed on opposite ends of the magnetoresistive sensor layer in a region from the end surface of a media-opposed surface side of the magnetoresistive sensor layer to the depth position are made of a material having a specific resistance not less than 10 mΩcm, and are in contact with at least opposite end surfaces of said magnetoresistive sensor layer in said region; wherein

each magnetic domain control layer of said magnetic domain control layers includes regions of hard magnetic material having high coercivity made of a metal magnetic material having a composition including at least one of the elements of Co (cobalt), Cr (chromium), Pt (platinum), Ta (tantalum), and Nb (niobium), and regions

of insulating material made of at least one of Al_2O_3, SiO_2, HfO_2, TaO_2, TiO_2, Ta_2O_5, AlN, AlSiN, or ZrO_2, said each magnetic domain control layer including at least two of the regions of hard magnetic material which are separated from one another.

33. (Previously Presented) A magnetoresistive sensor including a substrate, a pair of magnetic shield layers consisting of a lower magnetic shield layer and an upper magnetic shield layer, a magnetoresistive sensor layer disposed between the pair of magnetic shields, an electrode terminal for flowing a signal current perpendicular to the plane of the magnetoresistive sensor layer, and magnetic domain control layers, wherein a magnetic domain control layer of said magnetic domain control layers is disposed on each of opposite ends of the magnetoresistive sensor layer in the region from the end surface of the media-opposed surface side of the magnetoresistive sensor layer to the depth position and includes a layer made of a soft magnetic material having high electric resistivity disposed in contact with opposite ends of said magnetoresistive sensor layer, and a hard magnetic layer, disposed outside the soft magnetic material, made of a metal magnetic material having a composition including at least one of the elements of Co (cobalt), Cr (chromium), Pt (platinum), Ta (tantalum), and Nb (niobium).

34. (Previously Presented) A magnetoresistive sensor including a substrate, a pair of magnetic shield layers consisting of a lower magnetic shield layer and an upper magnetic shield layer, a magnetoresistive sensor layer disposed between the pair of magnetic shields, an electrode terminal for flowing a signal current

perpendicular to the plane of the magnetoresistive sensor layer, and magnetic domain control layers for controlling Barkhausen noise of said magnetoresistive sensor layer, wherein a magnetic domain control layer of said magnetic domain control layers is disposed on opposite ends of the magnetoresistive sensor layer in a region from the end surface of a media-opposed surface side of the magnetoresistive sensor layer to the depth position are made of a material having a specific resistance not less than 10 mΩmn, in contact with at least opposite end surfaces of said magnetoresistive sensor layer in said region; wherein

said magnetic domain control layer comprises a layer made of a soft magnetic material having high electric resistivity disposed in contact with opposite ends of said magnetoresistive sensor layer, and a <u>hard</u> magnetic layer, disposed outside the soft magnetic material, made of a metal magnetic material having a composition including at least one of the elements of Co (cobalt), Cr (chromium), Pt (platinum), Ta (tantalum), and Ni (niobium).

35. (Previously Presented) The magnetoresistive sensor according to claim 34, wherein said magnetic domain control layer is at least partially superimposed on the plane of said magnetoresistive sensor layer.

36. (Previously Presented) The magnetoresistive sensor according to Claim 34, wherein said magnetoresistive sensor layer is a tunnel magnetoresistive layer.

37. (Previously Presented) The magnetoresistive sensor according to claim 33, wherein at least one of the layer and hard magnetic layer of the magnetic domain control layer is a granular layer.

38. (Previously Presented) The magnetoresistive sensor according to claim 34, wherein at least one of the layer and hard magnetic layer of the magnetic domain control layer is a granular layer.

39. (Previously Presented) The magnetoresistive sensor according to claim 33, wherein the hard magnetic layer is disposed separated from the soft magnetic material.

40. (Previously Presented) The magnetoresistive sensor according to claim 34, wherein the hard magnetic layer is disposed separated from the soft magnetic material.